Table of contents

1 Introduction 3
1.1 Objectives of the guideline 3
1.2 Methodology of guideline development 3
1.3 Preliminary remark 5
2 Terms, classification and meaning 5
2.1 Definition and delimitation 5
2.2 Functional rhinosurgery 6
2.3 Disturbances of the shape of the inner nose 8th
2.4 Disorders of the shape of the external nose 9
2.5 Combinations and other findings 11
3 Symptoms, findings, examinations 11
3.1 Symptoms, anamnesis 11
3.2 Findings, investigations 12
3.3 Documentation 14
4 Surgery: goal, indications, contraindications, outpatient/inpatient 15
4.1 Objective of the operation: 15
4.2 Indications for surgery 16
4.3 Operational contraindications 18
5 Preparation 19
5.1 Operation planning 19
5.2 Preoperative information: 19
6 Operational aspects 20
6.1 Timing of the operation 20
6.2 Surgical technique 21
6.3 Perioperative measures 24
7 Postoperative considerations 24
7.1 General recommendation for follow-up treatment 24
7.2 Early complications 25
7.3 Late complications 25
7.4 Follow-up operations 25
8th Financing and conflicts of interest 26
9 Further development of the guideline 27
10 Attachment 28
11 Bibliography 30

1 Introduction

1.1 Objectives of the guideline

The aim of this guideline is to promote high-quality specialist medical care for patients with shape disorders of the inner and outer nose that are accompanied by a functional impairment or a relevant aesthetic impairment. This should contribute particularly to the reduction of the associated disease-related morbidity, to the rational use of diagnostic and therapeutic procedures and to the reduction of disease-related socio-economic factors.

The aim is to provide sensible, appropriate diagnostics and therapy based on the current state of technical knowledge.
The guideline was designed for use in the context of outpatient and inpatient specialist medical care and is therefore aimed specifically at specialists in ear, nose and throat medicine, oral and maxillofacial surgery as well as plastic and aesthetic surgery and their subordinate doctors of further training.

1.2 Methodology of guideline development

The client of this guideline is the German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery (DGHNOKHC). This guideline was created under the direction of Prof. Dr. med. Jörg Lindemann (guideline coordinator).
Guidelines are systematically developed instructions that provide the basis for the joint decision by doctors and their patients regarding sensible health care (in individual cases). In individual cases, it may make sense to adapt the diagnostic and therapeutic measures to individual circumstances.

The guideline on "formal disorders of the inner and outer nose (with functional and/ or relevant aesthetic impairment)" was drawn up in accordance with the methodological specifications for the development of guidelines for diagnostics and therapy of the Working Group of Scientific Medical Societies (AWMF) and corresponds to the 3 -Step concept of the AWMF for an S2k guideline.

In accordance with the AWMF specifications, the guideline group was composed of a multidisciplinary group that was representative of the target group.

The patient target group is patients with functional and/or relevant aesthetic impairment of the nose due to shape disorders of the inner and/or outer nose.

The authors are not aware of a patient organization corresponding to the topic of the guideline. Therefore, no patient representatives could be involved.

The guideline was created using a formal consensus process according to the specifications and recommendations of the AWMF Guideline Commission in the sense of an "S2k" guideline.

A nominal group process was used as a consensus process. This includes the following steps:

1. Presentation of the statements/recommendations to be agreed upon
2. Silent note from the participants: Which statement/recommendation do they agree or disagree with? Additions and alternatives are noted by the moderator.
3. Registration of comments in the circulation process and summary of comments by the moderator
4. Preliminary vote to discuss the individual comments and create a ranking

5. Debate the various points of discussion
6. Final vote on each recommendation and all alternatives

These steps are repeated for each individual recommendation in the guideline.
This was independently moderated by a representative of the AWMF along the guidelines manuscript.
A final vote was reached on each recommendation and possible alternatives.

A uniform strong consensus was achieved for all recommendations in the guideline (according to AWMF rules: > 95% strong consensus / >75% consensus, > 50% majority agreement / <50% no consensus). The recommendations were

graduated as follows: strong recommendation = should / should not; Recommendation = should / should not; open recommendation = can be considered / can be avoided.

Following the guideline conference, a final version of the updated guideline was created. The boards of the participating professional societies finally approved this final version. The following specialist societies were involved: German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery, German Society of Plastic, Reconstructive and Aesthetic Surgeons, German Society for Oral, Maxillofacial and Facial Surgery, German Professional Association of Ear and Nose Surgery -Ear doctors e. V..

1.3 Preliminary remark

After discussion, participants in the consensus conference agreed that detailed descriptions of surgical procedures should be omitted. On the one hand because of the variety of methods and on the other hand in view of the rapid increase in knowledge about the (patho-)physiology of the nose, to which functional-restoring surgical techniques must be continuously adapted. In addition, due to the great variability in the initial findings, an individualized approach is required for each patient and a "standard procedure" cannot therefore be generally recommended. With regard to operational details, please refer to the relevant surgical teachings.

2 terms, classification and meaning

2.1 Definition and delimitation

In connection with plastic surgery, terms are sometimes used that have different meanings but are often not clearly differentiated from one another.

Forthis guideline The following definitions therefore apply:

Plastic surgery: Surgical procedures to change shape

method	Construction:	Manufacturing
	Reconstruction:	Restoration
Goal	Function:	Establishment/restoration of a function.
	Aesthetics:	Establishment/restoration a normal shape or a symmetry (abnormal → normal)
	Cosmetics:	Beautification of the individual nose shape (normal → optimal)

This guideline essentially refers to shape disorders of the inner and outer nose that require normalizationfunctional and orrelevant is necessary for aesthetic reasons (functional-aesthetic septorhinoplasty). Relevant The authors view aesthetic changes as those that are understandable, that is, measured against collective and widespread perceptions, perceived as disadvantageous and stigmatizing for the respective ethnic group and contribute to functional limitations (e.g. crooked nose, tension nose, saddle nose/wide nose) [1].

Purely cosmetic Rhinoplasties in the true sense arenot The subject of this guideline, as well as replacement plastics for defects (usually after removal of tumors).

2.2 Functional rhinosurgery

The shape of the outer and inner nose is variable and deviates more or less from an ideal shape. Functional impairments such as nasal breathing obstruction and its consequences (e.g. disorders of breathing air conditioning, olfactory disorders, etc.) can result from the shape disorder of a single component (e.g. septal deviation) or from the combinations of several shape disorders (e.g. crooked nose with septal deviation and turbinate hypertrophy). The characteristics of each individual

However, form disturbance does not automatically correlate with the severity of the functional limitation. On the one hand, irregularities in the shape of the outer nose are often accompanied by irregularities in the shape of the inner nose; On the other hand, isolated corrections of internal structural irregularities (e.g. septoplasty) are often not sufficient to improve function if the shape of the external nose is simultaneously disturbed. In these cases, a combined internal and external correction (septo-rhinoplasty: SRP) is necessary, if necessary with correction of the nasal turbinates.

There are also relevant shape disorders of the external nose, which e.g. B. due to malformations, trauma or previous operations (e.g. due to tumors) lead to an impairment of the external appearance and are registered by outsiders as "conspicuous to disfiguring". Secondarily, this can lead to stigmatization and psychological stress for those affected.
Here, an operation is required regardless of any concurrent functional disorders to restore a largely normal appearance appropriate to the ethnic group (aesthetic rhinoplasty).

This is to be distinguished from isolated onescosmetic Corrections to the external nose, which serve to change the nose as desired (purely cosmetic rhinoplasty), which are not the subject of this guideline.

In contrast to an aesthetic rhinoplasty, a functional-aesthetic septo-rhinoplasty is used to create or restore adisturbed function through a simultaneous change in the inner and outer nose.

The following**Features**are dependent on the correct shape of the nasal entrance, the nasal valve, the main nasal cavity with the nasal turbinates, the choana with the adjacent pharynx and the condition of the covering mucous membrane surface:

- Breathing air flow, breathing resistance and breathing air conditioning :
  If the resistance when breathing through the nose is too high, this results in predominant or exclusive mouth breathing with the possible consequences of chronic inflammation of the mucous membranes in the oral cavity, pharynx, larynx, trachea and possibly...

also bronchi as well as the adjacent paranasal sinuses and the middle ears. Drying out and demineralization of the teeth also increases the risk of damage to the hard tooth structure, tooth defects and tooth decay [2].

Heating and humidifying the inhaled air (air conditioning) serves to protect the deeper respiratory tract and ensure optimal pulmonary gas exchange in the alveoli. When you breathe through your mouth, this nasal function fails, so that the above-mentioned consequential damage can occur. Of particular importance is the impairment of the mucociliary transport system, which serves to remove foreign bodies (e.g. allergy-causing pollen, toxic particles, bacteria, fungal spores, etc.). When you exhale, some of the heat and moisture from the air you breathe is recovered in the nasal passages.

- Particle filtration **:**
  Larger suspended particles of up to 10 µm in particular are retained by the vibrissae and bound in the mucous film, transported to the nasopharynx with the help of the mucosal cilia and from there neutralized and disposed of via the gastrointestinal tract. A lack of filtration leads to a build-up of particles in the deeper airways with every breath.
- Immunological defense functions (including mucociliary transport)
- Olfactory function :
  Undisturbed olfactory function is essential for certain professions (e.g. chef). Their restriction or even failure not only means a significant loss in quality of life, but also in alarm functions (e.g. “burning smell”).

Below, only selected, typical shape disorders of the inner and outer nose are mentioned in key words with their characteristics.

2.3 Disturbances of the shape of the inner nose

Deviations the Nasal septum out of the Median sagittal plane (Septal deviation) will lead to a more or less severe nasal breathing obstruction depending on the location and severity. Even small deviations can be significant in the area of narrow areas (nasal entrance, nasal valve).

Result in increases in resistance. These include in particular deviations of the caudal septal edge (luxation, bending, fracture), floor ridges, ascending septal ridges and oblique position of the septum (septal cartilage and lamina perpendicularis). Pronounced asymmetries in the cross sections mean that the narrower side of the nose is not fully available for air conditioning of the breathing air, while the wider side of the nose can only fulfill its function to a limited extent due to the increased flow. The correction of the nasal septum not only serves to normalize increased breathing resistance, but also to improve the air conditioning function. Disturbances in the shape of the nasal septum, which lead to narrowing of the ostia of the paranasal sinuses, can promote the development of recurrent acute rhinosinusitis. In addition, deviations in the nasal septum can lead to pain and ulceration of the mucous membrane due to localized impact of inhaled air.

Septal perforations can lead to crust formation, olfactory impairment, frontal headache, nasal obstruction and recurrent nosebleeds as well as whistling noises depending on the location and size of the continuous defect.
The variable erectile tissue of the nasal turbinates and the nasal septum regulates the width of the nose and thus the air permeability. Pathological mucosal hyperplasia, in addition to deformities of the bony infrastructure (os turbinale, concha bullosa), can be a significant factor in nasal dysfunction.

A notice:
All of the form disorders mentioned can occur in isolation or in combination and must be included in a therapy concept after considering their contribution to the functional disorder.

2.4 Disorders of the shape of the external nose

This is an exemplary list of shape disorders of the external nose without any claim to completeness.

<u>crooked nose:</u>

Deviation of the nasal bridge/structure from the median-sagittal plane. A distinction is made between genetically determined crooked noses and acquired crooked noses. In particular, genetically determined crooked noses are often accompanied by nasal and facial asymmetry. A misalignment of the external nose does not necessarily have to lead to a functional disorder. However, since the external and internal nose form an anatomical unit, a crooked position of the external nose is generally accompanied by a septal deviation and narrowing of the nasal valves. This generally results in nasal dysfunction. Depending on the extent of the misalignment, a decision must be made as to whether a septoplasty is sufficient to improve function or whether the outer nose also needs to be straightened.

Saddle nose / broad nose:

After nasal trauma, previous operations on the nose, growth disorders (nasomaxillary dysplasia) or specific diseases (e.g. granulomatosis with polyangiitis, leprosy, syphilis), the profile of the nasal bridge (saddle nose) may be lowered, possibly with widening of the bridge of the nose and the base of the nose (broad nose). The insufficient height of the nasal septum leads to an abnormal expansion of the nasal valve ("ballooning phenomenon"). This, together with a change in the shape of the nasal entrance, results in a deflection of the breathing air flow with uneven flow through the nasal cavity and restricted breathing air conditioning.

Hump nose:

When the tip of the nose is in a normal position (projection), the bridge of the nose protrudes beyond the line connecting it to the root of the nose. If all other anatomical details are within the normal range, this usually resultsno Functional impairment.

Tension nose:

The bridge of the nose is clearly elevated in profile along with the tip of the nose. The underlying cause is excessive growth of the bony nasal structure and several cartilaginous components of the nose, especially the septal cartilage. The result is a narrow, high pyramid with a reduced cross-sectional area. The nasal entrance plane is narrowed in the nasal valve area (nasal valve angle

less than 15°). The nostrils are slit-shaped and narrow. The base of the columella is widened. Due to their elongated shape and thin walls, the nostrils tend to collapse during inspiration (suction phenomenon). A tension nose differs from a hump nose in the details mentioned and is usually associated with a functional impairment.

2.5 Combinations and other findings

Deformities of the external nose can also occur in combination, e.g. crooked saddle nose or crooked tension nose.

Disorders of the shape of the base of the nose and the nasal entrance:

The nasal entrance and the nasal base represent narrowings of the nasal passages and, due to their complex, anatomical structure, can exhibit a variety of functionally relevant shape disorders. These include, among others:

- Cleft lip and palate
- Suction phenomenon of the nostrils (see above) with deformation of the alar cartilages and instability of the nostrils
- Nasal entry stenosis with columellar retraction and widening
- Malposition of the tip of the nose (over/under projection)
- Narrowing of the bony base of the nose (apertura piriformis)

Formal disorders with relevant aesthetic impairment:

These include, above all, noticeable asymmetries when comparing sides (e.g. in cleft-related deformities, substance defects, scarring) or noticeable disproportions of individual sections of the nose (upper, middle, lower third of the nose), especially in relation to the overall face (e.g. large nose). In addition, there is bony dehiscence on the bridge of the nose, so-called open roof (e.g. after trauma or previous surgery). [3, 4, 5, 6, 7, 8]

3 symptoms, findings, examinations

3.1 Symptoms, anamnesis

- Functional impairments

- Impaired respiration: nasal breathing obstruction, nasal breathing noise, dryness, crust formation
- Epistaxis
- Hypersecretion
- Impaired olfactory function with possibly associated taste disorders
- Other malfunctions: dysphonia, damage the Hard tooth substance in the area of the front of the upper jaw, problems when wearing glasses, facial pain, headaches, recurrent sinusitis, worsening of asthmatic and allergic symptoms, ventilation problems in the ear, associated sleep disorders

- Psychological impairment due to aesthetic form deviation

- Special nasal history: symptoms (see 4.1), malformation, trauma, previous operation, sinus diseases, allergy (including plaster allergy), benign or malignant tumors, bleeding tendency, known autoimmune (e.g. granulomatosis with polyangiitis) or infectious diseases (e.g. corona, syphilis). , leprosy), drug abuse (e.g. cocaine), Zn filler injections or thread lift, topical or systemic medication with a damaging effect on the mucosa (e.g. privinism, isotretinoin, immunosuppressants)

- If necessary, additional use of symptom-related questionnaires, such as NOSE GAV, SNOT-20 GAV, SNOT-22 D, PISA dysmorphophobia questionnaire [9, 10, 11, 12, 13]

3.2 Findings, investigations

- Inspection of the external nose: Proportion of the nose in relation to the other facial components (facial profile, asymmetry). Specific size ratios of individual nasal components to one another. Assessment of the nose root, bridge, tip, bridge, wing,

- flank and base. Angle measurements between forehead-nose-upper lip-chin. Texture of the skin (thick, thin, atrophic, sebaceous gland hyperplasia, telangiectasia, scars, inflammation). Inspection at rest and during forced breathing to detect a collapse of the nasal entrance, attention to a one-sided suction phenomenon as an indication of a contralateral obstruction or ipsilateral structural weakness of the alar cartilage, changes in the nose-lip complex during facial expression. Family and ethnic characteristics. Systematic assessment of the external nose from different perspectives.

- Inspection of the internal nose: anterior and posterior rhinoscopy with illumination. A nose and nasopharyngeal inspection should be performed rigidly or flexibly endoscopically.

- Palpation: Structure and condition of the soft tissue, bone, cartilage, if necessary of implants and scars. Assessment of the nasal valve, if necessary Cottle test

- Photo documentation: Photo documentation of the external nose should be carried out for every operation that causes a change in shape (e.g. view from the front, from the left/right side, from below (base), semi-oblique view left/right, view from the back above). In addition, photo documentation may also be useful for medical legal reasons.

- A rhinological function test should be carried out (e.g. rhinomanometry (before and after the swelling of the mucous membrane), rhinoresistometry (before and after the swelling of the mucous membrane), 4-phase rhinomanometry, acoustic rhinometry (before and after the swelling of the mucous membrane), long-term rhinometry or their combinations)

Further case-related investigations:

- Smell testing (e.g. sniffin sticks: identification before and after the mucous membrane subsides)

- Allergy diagnostics

- Suitable radiological Imaging (3-dimensional imaging diagnostics)

- If necessary, interdisciplinary consultation in the fields of ear, nose and throat medicine including phoniatrics, oral and maxillofacial surgery, orthodontics

- A subject-specific co-assessment can be carried out to quantify a relevant psychological impairment due to an aesthetic form deviation or to rule out a psychological/psychiatric comorbidity

Hints:

The above**rhinological functional diagnostics**nasal breathing (rhinomanometry, rhinoresistometry, acoustic rhinometry, 4-phase rhinomanometry) serves as an orientation aid for the indication of a functional septoplasty or septorhinoplasty. The implementation and results of the functional diagnostics mentioned are subject to errors and do not correlate reliably with the patient's subjectively impaired nasal breathing [14, 15]. They therefore cannot be the decisive and sole basis for an indication for a functional nasal procedure, but only provide additional information. The decisive factors for determining the indication are the patient's subjective complaints (usually obstructed nasal breathing) and the pathological nasal findings that can explain the complaints and can be treated surgically.

3.3 Documentation

Photo documentation : Photo documentation of the external nose should be carried out for every operation that causes a change in shape (e.g. view from the front, from

the side left/right, from below (base), semi-angled shot left/right, shot from the back above). In addition, photo documentation may also be useful for medical legal reasons.

Regarding computer-aided surgical planning and simulation, please refer to Chapter 5.

Surgery planning : the goals of the operation must be recorded in the patient file. This is particularly true when correcting the shape of the external nose, where the desired change should be documented.

enlightenment : Every medical service includes thorough and understandable information about treatment alternatives and the surgical measures available, their desired and undesirable results and their probability of occurrence, as well as their follow-up treatment. Particularly when correcting the shape of the external nose, the doctor requires a high level of information from the patient. As with the medical treatment of illnesses, the implementation of measures for non-disease-related conditions also requires that the person making the request (patient) gives their free and informed consent on the basis of appropriate and comprehensive information and issues a corresponding order for treatment has. In the case of combined aesthetic-functional interventions, the increased educational effort for the aesthetic component should be taken into account.

4 Surgery: Goal, indications, contraindications, outpatient/inpatient

4.1 Operation objective:

The surgical goals are to improve nasal breathing as well as plastic reconstructive and/or aesthetic correction of the inner and outer nose in harmony with the other facial structures. Rhinosurgical measures can also be used in addition to other surgical indications (e.g. procedures on the

paranasal sinuses and/or the skull base), may be necessary for cleft lip and palate or profile plastics.

4.2 Indications for surgery

The nose is a respiratory organ and part of the olfactory sensory system. It influences the sound of the voice and is an important immunological target organ. At the same time, the nose, as a central structural element on the face, has a special aesthetic significance. All these functions are inextricably linked morphologically and functionally. Nose surgery must therefore always take both functional and aesthetic criteria into account (see also Chapter 2). Nose operations with the aim of achieving an aesthetic or cosmetic change in shape should not impair the function, just as function-improving nose operations should not negatively change the aesthetics of the nose.

The guiding principle is that undisturbed nasal function requires normal anatomy. As a result, surgical correction of the nose aims to normalize function by normalizing the anatomy.
In the case of the key symptom "obstructed nasal breathing", the clinical findings recorded are groundbreaking for the indication. If a structural disorder is found and can be corrected surgically, an operation is indicated.

The symptom- and form-oriented surgical indications include, among others [3, 16]:

- Constantly or intermittently obstructed nasal breathing without secondary diseases or to prevent them [17]

- Constantly or intermittently obstructed nasal breathing with secondary illnesses such as: E.g. mouth breathing, rhinits medicamentosa, snoring, recurrent acute rhinosinusitis, recurrent otitis media, middle ear ventilation disorder

- Functional disorder (see Chapter 3)

- Deviation-related shape changes of the outer nose / nasal bridge and adjacent anatomical regions (cheek / upper jaw)

- Difficulty stopping bleeding during epistaxis

- Difficult access for intranasal drug applications or endonasal sinus procedures and dacryocystorhinostomy or transnasal neurosurgical procedures

- Improvement of breathing mask therapy for obstructive sleep apnea with nasal breathing obstruction

- Relevant aesthetic impairment (even without functional impairment), e.g. B. congenital (including cleft lip and palate deformity, other facial clefts), traumatic and after previous surgery

- Establishing form and function in the case of malformations (e.g. Binder syndrome)

- Optimization of orthodontic treatment for existing nasal breathing obstruction

- Tumors of the internal and external nose

- Procedures on the nasal turbinates for hyperplasia or deformity, concha bullosa and non-allergic rhinitis

- Narrowing of the nasal cross-section in empty nose syndrome (e.g. through submucosal turbinate or septal augmentation)

- Migraine-like hemilateral headache, e.g. B. with turbinate-septum contact

4.3 Operational contraindication

- Age: special indication and justification in children and adolescents, taking into account the "biological" age of the respective patient

- Suspicion of dysmorphophobia or other relevant psychiatric disorders

- Pregnancy during elective procedures

- Reduced general condition (e.g. diseases of the cardiovascular system, metabolic diseases, consumptive diseases)

  Exception: absolutely necessary functional improvement, e.g Breathing mask therapy for sleep-disordered breathing

- Treatment-resistant coagulation disorders and bleeding tendencies

- Acute infections of the inner nose and paranasal sinuses (e.g. viral and bacterial rhinosinusitis, provided these are not refractory to therapy)

- Acute infectious diseases (e.g. Covid-19)

- Acute infections of the nasal skin

- Unclear motivation, unrealistic expectations, unfulfillable patient's desire for surgery

- Lack of agreement between patient and doctor about the surgical goal

5 Preparation

5.1 Operation planning

The operation planning is carried out based on the findings collected and coordinated with the patient using suitable aids. This includes, for example, written explanations, drawings and photos.
Note: Patients for whom computer simulation is planned must be made aware of the limitations of the reduplicability/reproducibility of this simulation. Exaggerated expectations should be counteracted by pointing out that a simulation demonstrates an exemplary surgical result, from which deviations are possible due to the biological variation in the tissue reaction.

5.2 Preoperative information:

For all nasal operations, i.e. all procedures on the inner and outer nose, with and without simultaneous procedures on the nasal turbinates, excessive bleeding, postoperative bleeding, wound infections, inadequate functional results, dry nasal mucosa with sometimes foul-smelling crusting and infection, septal hematoma, septal abscess, septal perforation must be taken into account , endonasal synechiae, unwanted change in shape of the external nose, cosmetic deterioration and disfigurement, altered facial expressions, nasal hyperreactivity with rhinorrhea, olfactory disorder including impaired olfactory sensation, skin and sensory changes, change in the firmness of the nose, disruption of tear drainage with epiphora. Particularly in the case of septorhinoplasty, additional information must be provided about skin and soft tissue damage, scarring, pressure points on the skin, unwanted and unsatisfactory changes in the shape of the outer nose, and irregularities on the bridge of the nose.

The effects of nicotine on wound healing and function are controversial [18, 19, 20, 21, 22, 23]. However, the possibility that nicotine abuse has a negative impact on healing, limits functional improvement and increases the risk of perforation should be clarified preoperatively.

The patient should be informed about specific postoperative behavioral measures (e.g. wearing contact lenses for those who wear glasses, postoperative sun protection, no contact sports).
Both standardized and individual information sheets can be used for information purposes.
Particularly high demands must be placed on preoperative information for functional aesthetic indications. In particular, it must be explained that, despite carrying out the procedure correctly, a result may still be achieved that does not satisfy the patient.
It should also be noted that the final result is often only visible after a few months and that subsequent corrections/fine corrections may be necessary and possible. Furthermore, the operation itself can cause new deformities to occur as a result of impaired wound healing.
Later changes to the internal and external nose can occur as a result of aging, exposure to sunlight, or other external circumstances. Long-term changes are also possible due to uncontrollable scarring processes that vary from person to person.

Therefore, no long-term guarantees can be given for the results of the operation.

In particular, when it comes to revision procedures, it should be explained that revisions generally have a higher complication rate. Furthermore, during revisions to maintain or restore the stability of the septum and/or the nasal wings, information should be given about the possible removal of autologous ear cartilage or costal cartilage.

6Operational aspects

6.1 Timing of the operation

- Surgery, if possible, after facial growth is complete

  Exception: pronounced functional and/or aesthetic deformity with risk of serious sequelae

- Revision procedures usually not earlier than 6 - 12 months after the last operation, in exceptional cases (e.g. skin necrosis, transplant rejection) accordingly earlier

- For cleft lip and palate (cleft lip): primary procedure in the sense of a closed, partial (septo)rhinoplasty to correct serious deformities together with cleft lip plastic from the 3rd to 6th. month of life possible. In the case of double-sided LKG clefts, nasal bridge lengthening may become necessary during growth (approx. 5-6 years). Final septorhinoplasty is generally carried out after the completion of growth (girls from around 16 years of age, boys from around 18 years of age) and after any necessary adjustment osteotomies have been carried out, or earlier in individual cases in the case of severe functional disorders [24].

6.2 Surgical technique

The basic techniques of septo-rhinoplasty must be adapted to the individual circumstances in each individual case and, if necessary, modified and expanded.

It therefore makes no sense to go into detail about individual surgical steps. In principle, the following come into question:

Septoplasty, reconstruction as a sole measure for exclusively functional disorders or as part of a septorhinoplasty and as an additional measure for other surgical indications (e.g. surgical intervention on the paranasal sinuses, dacryocystorhinostomy, skull base, pituitary gland).

There are various procedures available to the surgeon to correct a nasal septal deformity, which differ primarily in the approach, incisions and correction/ reconstruction technique used. The goal in each case is a straight, sufficiently dimensioned and stable infrastructure in a regular position with sufficient fixation.

Reductive-reconstructive ("reducing") rhinoplasty for tension nose, hump-crooked nose, large/long nose, hump nose.

Augmentation-reconstructive ("enlarging") rhinoplasty in saddle wide noses, in particular functionally improving structure of the septum in saddle noses, short shrunken nose, lack of support and height of the nasal tip (protection and projection), substance defects and irregularities e.g. after previous septorhinoplasty, cleft nose deformity, Binder syndrome (naso-maxillary dysplasia), others Nasal malformations and tumor diseases with substance deficiencies in the bone-cartilage pyramid and/or the soft tissues.

Corrective-reconstructive ("straightening") septorhinoplasty for crooked noses and other asymmetries, possibly in combination with the correction of a hump, saddle and cleft nose deformity.

Corrective-reconstructive rhinoplasty of the caudal nose for deformities of the tip of the nose, the wings of the nose and the bridge of the nose, usually in combination with the correction of an additional nasal deformity.

Corrective-reconstructive measures in the area of the nasal valves in the event of functional disorders in the isthmus and nasal area.

Special instructions:
At LKG split noses Additional measures may be necessary, e.g. tube middle ear drainage, jaw cleft osteoplasty or other measures in the area of oral, maxillofacial and facial surgery, orthodontic measures.

Grafts and implants in reconstructive/augmenting rhinosurgery Septum, auricle or rib cartilage can be used as autogenous cartilage transplants, depending on availability and the need for volume and stability. Sometimes bone, such as parts of the lamina perpendicularis or iliac crest, can also be used as graft material.

Any transplants placed can lead to unnatural stiffness of the nose. The patient should be made aware of this fact before surgery. Autogenous fascia, dermis and fatty tissue are not suitable as structural support transplants, but can be used to fill volume deficits and camouflage irregularities [25].

Alloplastic materials (implants) tend to have a higher extrusion rate and should only be used in exceptional cases [25, 26, 27].

Operations on the nasal turbinates

Measures on the lower and middle nasal turbinates are only possible more optional Part of functional rhinosurgery. The variety of techniques indicates that each has advantages and disadvantages associated with turbinate surgery. In most cases, a combination of both lateral displacement (lateroposition) and volume reduction will be required on the lower nasal turbinates. The turbinate bone is primarily responsible for the position of the inferior nasal concha. To achieve a lateroposition, it can be either fractured, osteotomized, or partially resected.

Resecting or coagulating procedures are available to reduce the volume of the erectile tissue.
Transmucosal procedures (cryotherapy, infrared coagulation, coagulation with various types of laser) leave mucosal scars and should therefore only be used to a limited extent on the caudal and lateral surface of the turbinate.
Enlarged middle nasal turbinates usually involve a pneumatized concha bullosa, which can be reduced in size by removing the lateral layer of mucous membrane while preserving the turbinate. If the lateral position is excessive, the middle turbinate can be medialized toward the septum using a transseptal suture to the septum.
Complete resections of the turbinates (turbinectomies) as well as over-resections of turbinate tissue (e.g. so-called "strip conchotomy") should be avoided, except in the case of histologically proven tumors. Treatment-resistant crusts with foul-smelling infections ("stinky nose") or empty nose syndrome can result.

Interventions on the nasal turbinates should be carried out visually controlled (e.g. endoscopically).
[28, 29, 30, 31, 32, 33, 34, 35, 36]

6.3 Perioperative measures

Perioperative antibiotic prophylaxis: There is currently no uniform recommendation. Single-shot prophylaxis, administered as part of the induction phase of anesthesia, is useful for planned cartilage transplants and revision procedures. Decongestant and bleeding-reducing measures, e.g. through tamponades/swabs with vasoconstrictive medications, intraoperative cooling and controlled arterial hypotension, create a clearer operating field and help to reduce postoperative bleeding, swelling and hematomas in the area of the nose and adjacent facial soft tissues.

7 Postoperative considerations

7.1 General recommendation for follow-up treatment

- If nasal packs are inserted, they should be secured against aspiration.

- Depending on the case, internal and external splinting for stabilization, hematoma and swelling prevention of the septum and external nose. Removal of the thread-reinforced tamponade and the inner and outer splints varied depending on the extent of the procedure and healing process, if necessary

- Recommendation of individual rules of conduct for patients

- Nasal entry space maintainer after nasal entry expansion with flaps or transplants over several weeks

- Mucous membrane care (e.g. isotonic nasal sprays, nasal rinses, possibly decongestant nasal sprays, nasal oils, nasal ointments (possibly containing antibiotics) for about 3 to 4 weeks postoperatively

- Post-operative check-ups with, if necessary, photo documentation if there has been a change in the external shape of the nose

7.2 Early complications

Early complications include bleeding, hematomas, abscesses, local infections due to sewn-in septal foils and transseptal sutures, dislocation of the mobilized nasal bones, toxic shock-like syndrome due to nasal packing, infections of the soft tissues, skin necrosis and plaster allergy.

7.3 Late complications

- New undesirable change in shape of the external nose (recurrence of shape change, pollybeak deformity)
- Recurrence of functional complaints due to recurrence of septal deviation, nasal valve stenosis or turbinate hyperplasia
- Septal perforation
- Dry nasal mucosa with crusts, frequent nosebleeds
- Sinking and irregularities of the tip and bridge of the nose, collapse of the nostrils due to altered projection and protection
- Endonasal synechiae
- Empty nose syndrome in extensive turbinate resections and scarring

- Olfactory disorders in endonasal scarring with impaired flow through the upper nasal passage and in empty nose syndrome due to a lack of nasal secretion and crust formation
- Warping and step formation in the area of the columellar scar after the open technique
- Sensory disturbances and pain symptoms of the nose, lips, cheeks and oral cavity
- Skin redness, telangiectasia and pigment shift
- see also Chapter 5.2 “Preoperative information”

[26]

7.4 Follow-up operations

- Critical analysis of the cause of the patient's complaints
- Review of preliminary findings (e.g. pre-operation reports, photos)

- Check and explain the use of ear or rib cartilage
- Discuss critically the nature and limits of any further intervention with the patient
- The timing of revision surgery is usually no earlier than 6-12 months after the last operation, only earlier in exceptional cases

8 Funding and Conflicts of Interest

The guideline was created on behalf of the German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery (DGHNOKHCH) on September 5th, 2008, November 24th, 2014 and August 3rd, 2020.

The guidelines were drawn up with editorial independence.

The guideline was developed without external funding and exclusively with the financial resources of the German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery and the other specialist societies involved (German Society for Oral, Maxillofacial and Facial Surgery eV, German Society of Plastic, Reconstructive and Aesthetic Surgeons, German Professional Association of Ear, Nose and Throat Doctors).

Travel costs were partly borne by the delegating companies or associations. There was never any direct or indirect support for the project, particularly financial support from third parties.

The guidelines were created by the authors of the guidelines on a voluntary basis and without financial compensation. The personal conflicts of interest of the individual authors have been stated in advance by all participating authors on the AWMF portal "Declaration of Interests Online" (https://interesterklaerung-online.awmf.org/). None of the authors had any conflicts of interest for the guideline, so that all participants in the consensus process were able to vote on all recommendations and possible alternatives. The assessment of the information on conflicts of interest was carried out by Prof. Dr. Fabian Sommer (ENT University Hospital Ulm) in accordance with the specifications of the AWMF organization online on the AWMF "Declaration of Interest Online" portal. Prof. Dr. Fabian Sommer was not a member of the guidelines group.

We would like to thank the authors and participants in the consensus process for their entirely voluntary work.

9 Further development of the guideline

The guideline coordinator is responsible for updating the guidelines.

An update of the guideline "Formal disorders of the inner and/or outer nose (with functional and/or relevant aesthetic impairment)" is planned after five years on May 1st, 2027 after the last content revision on April 30th, 2022.

10 Appendix

Composition of the authors for developing the updated guideline:

Surname	Institute	professional society
Prof. Dr. Jörg Lindemann (guideline coordinator)	Ear and nose clinic ear medicine, Ulm University Hospital	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
PD Dr. Achim Beule	Ear and nose clinic ear medicine, University Hospital Münster	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Prof. Dr. K. Wolfgang Delank	Ear and nose clinic ear medicine, Ludwigshafen Clinic	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Prof. Dr. Werner Heppt	Ear and nose clinic Otology, Karlsruhe Hospital	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
PD Dr. Tanya Hildenbrand	Ear and nose clinic ear medicine, university hospital Freiburg	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Prof. Dr. Frank Riedel	ENT Center Rhine-Neckar, Mannheim	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery Working Group for Plastic, Reconstructive and Aesthetic Head and Neck Surgery (APKO) ENT professional association
Prof. Dr. Marc Scheithauer	Ear and nose clinic ear medicine, Ulm University Hospital	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Prof. Dr. Jochen Wurm	Ear and nose clinic ear medicine, university hospital Erlangen	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Dr. Sebastian Haack	Clinic for Plastic Surgery, Marienhospital Stuttgart	German Society of Plastic, Reconstructive and Aesthetic Surgeons
Dr. Helmut Fischer	Clinic for Plastic Surgery, Marienhospital Stuttgart	German Society of Plastic, Reconstructive and Aesthetic Surgeons
Prof. Dr. Dr. Siegmar Reinert	Clinic for oral, maxillofacial and facial surgery, Tübingen University Hospital	German Society for Oral and Maxillofacial Surgery Facial Surgery eV
Dr. Carsten Schroen	ENT Center Ingolstadt	German Professional Association of Ear, Nose and Throat Doctors. v.

The nominal group process for consensus building took place on October 13, 2021 under the leadership of PD Dr. Sitter (representative of the AWMF organization) with the participation of various specialist representatives took place in Ulm.

The participants in the consensus conference were:

Surname	Institute	professional society
Prof. Dr. Jörg Lindemann (guideline coordinator)	Ear and nose clinic ear medicine, Ulm University Hospital	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
PD Dr. Achim Beule	Ear and nose clinic ear medicine, University Hospital Münster	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Prof. Dr. K. Wolfgang Delank	Ear and nose clinic ear medicine, Ludwigshafen Clinic	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Prof. Dr. Frank Riedel	ENT Center Rhine-Neckar, Mannheim	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery Working Group for Plastic, Reconstructive and Aesthetic Head and Neck Surgery (APKO) ENT professional association
Prof. Dr. Marc Scheithauer	Ear and nose clinic ear medicine, Ulm University Hospital	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Prof. Dr. Jochen Wurm	Ear and nose clinic ear medicine, university hospital Erlangen	German Society for Ear, Nose and Throat Medicine, Head and Neck Surgery
Dr. Sebastian Haack	Clinic for Plastic Surgery, Marienhospital Stuttgart	German Society of Plastic, Reconstructive and Aesthetic Surgeons
Dr. Helmut Fischer	Clinic for Plastic Surgery, Marienhospital Stuttgart	German Society of Plastic, Reconstructive and Aesthetic Surgeons
Prof. Dr. Dr. Siegmar Reinert	Clinic for oral and maxillofacial surgery, Tübingen University Hospital	German Society for Oral and Maxillofacial Surgery Facial Surgery eV
Dr. Carsten Schroen	ENT Center Ingolstadt	German Professional Association of Ear, Nose and Throat Doctors. v.

11 Bibliography

1 Schöne-Seifert B, Beule A, Jömann N, Stier M, Gabriels G. Aesthetic procedures at university hospitals. German medical journal. 2021 June, 6: 269-271.

2 Bakor SF, Pereira JCM, Frascino S, Gonçalves, TCC, Ladalardo P, Pignatari SSN, Weckx LLM. Demineralization of teeth in mouth-breathing patients undergoing maxillary expansion. Braz J Otorhinolaryngol. 2010; 76:709-12.

3 Rettinger G. Procedures on the nose. In Theissing J, Rettinger G, Werner JA: ENT surgery theory, Georg Thieme Verlag, 5th edition, 2017.

4 Huizing, de Groot: Functional corrective nasal surgery. Georg Thieme Verlag Stuttgart, 2nd edition 2015.

5 Gubisch W. The large nose - an aesthetic, but also a functional problem. Laryngorhinotology. 1994; 73:244-8.

6 Zhu JH, Lee HP, Lim KM, Lee SJ, San LTL, Wang DY. Inspirational airflow patterns in deviated noses: a numerical study. Comput Methods Biomech Biomed Engin. 2013; 16:1298-306.

7 Keck T, Lindemann J: Flow simulation and air conditioning of the nose. Laryngorhinotology. 2010; 89: Suppl. 1:1-14.

8 Lindemann J, Schmadl A, Scheithauer MO, Hoffmann TK, Sommer F, Grossi AS, Stupp F. Analysis of facial asymmetry in patients with crooked noses. Laryngorhinotology. 2019; 98(11): 797-802.

9 Baumann I, Blumenstock G, DeMaddalena H, Piccirillo JF, Plinkert PK. Quality of life in patients with chronic rhinosinusitis: validation of the Sino-Nasal Outcome Test-20 German Adapted Version. ENT 2007; 55(1): 42-7.

10 Hildenbrand T, Ketterer MC. Quality of Surgical Therapy of Chronic Inflammatory Diseases of the Paranasal Sinuses. Laryngorhinotology 2020; 99: S5-S33.

11 Lindemann J, Scheithauer MO, Hoffmann TK, Stupp F, Grossi AS, Sommer F, Netzer S. Adaptation of the “Nasal Obstruction Symptom Evaluation” (NOSE©) questionnaire in the German language. Laryngorhinotology 2019; 98(08): 562-567. 12 Spiekermann C, Savvas E, Rudack C, Stenner M. Adaptation and validation of the nasal obstruction symptom evaluation scale in German language (D-NOSE). Health Qual Life Outcomes (2018) 16:172; https://doi.org/10.1186/s12955-018-1004-x.

13 Perugi G, Akiskal H, Giannotti, D, Frare F, Di Vaio S, Cassano G. Gender-related differences in Body Dysmorphic Disorder (Dysmorphophobia). J Nerv Ment Dis 1997; 185: 578-582.

14 Wheeler SM, Corey JP. Review: Evaluation of upper airway obstruction – An ENT perspective. Pulmonary Pharmacology Therapeutics. 2008; 21: 433-441.
15 Passali D, Mezzedimi C, Passali GC. The role of rhinomanometry, acoustic rhinometry, and mucociliary transport time in the assessment of nasal patency. Ear Nose Throat J. 2000; 79: 397-400.
16 Behrbohm H, Tardy, ME Functional-aesthetic surgery of the nose, Thieme 2004, p. 244 p.
17 Beule AG, Riedel F, Deitmer T, Dazert S. Scientifically justified indication for nasal septoplasty. Laryngorhinotology. 2019; 98(5): 350-352.
18 Ak S, Kaplama ME. Effects of hookah and cigarette smoking on the recovery after septoplasty. Int J Clin Pract. 2021 Mar; 75(3): e13968. doi: 10.1111/ijcp.13968. Epub 2021 Jan 5. PMID: 33368967.
19 Andrews JE, Jones NN, Moody MP, Vincent AG, Teixeira JC, Thomas RF, Hohman MH. Nasoseptal Surgery Outcomes in Smokers and Nonsmokers. Facial Plast Surg Aesthet Med. 2021; 23(4): 283-288.
20 Cetiner H, Cavusoglu I, Duzer S. The effect of smoking on perforation development and healing after septoplasty. Am J Rhinol Allergy. 2017; 31(1): 63-65.
21 Utiyama DM, Yoshida CT, Goto DM, de Santana Carvalho T, de Paula Santos U, Koczulla AR, Saldiva PH, Nakagawa NK. The effects of smoking and smoking cessation on nasal mucociliary clearance, mucus properties and inflammation. Clinics (Sao Paulo). 2016; 71(6): 344-50.
22 Yazici ZM, Sayin I, Erdim I, Gunes S, Kayhan FT. The effect of tobacco smoking on septoplasty outcomes: a prospective controlled study. Hippocrates. 2015; 19(3): 219-24.

23 Habesoglu M, Demir K, Yumusakhuylu AC, Yilmaz AS, Oysu C. Does passive smoking have an effect on nasal mucociliary clearance? Otolaryngol Head Neck Surg. 2012; 147(1): 152-6.
24 Salyer KE, Xu H, Genecov ER. Unilateral Cleft Lip and Nose Repair; Closed Approach Dallas Protocol Completed Patients. J Craniofac Surg. 2009; 20: 1939-55.
25 Tasman AJ. Functional and aesthetic surgery of the nose: indications and techniques of rhinoplasty. Laryngorhinotology. 2007; 86:15-39.
26 Rettinger G. Functional and aesthetic surgery of the nose: risks and complications of rhinoplasty. Laryngorhinotology. 2007; 86: 40-54:

27 Berghaus A. Functional and aesthetic surgery of the nose: implants for reconstructive surgery of the nose and ear. Laryngorhinotology. 2007; 86: 67-76.

28 Hol MK, Huizing EH. Treatment of inferior turbinate pathology: a review and critical evaluation of the different techniques. Rhinology 2000; 38: 157-166.

29 Tasman AJ. The inferior nasal concha: dysregulation and surgical reduction. Laryngorhinotology. 2002; 81:822-838.

30 Clement WA, White PS. Trends in turbinate surgery literature: a 35-year review. Clin Otolaryngol 2001; 26:124-128.

31 Scheithauer MO. Surgery of the turbinates and "empty nose" syndrome. Laryngorhinotology 2010; 89 Suppl 1:79-102.

32 Sommer F, Scheithauer MO, Hoffmann TK, Grossi AS, Hauck K, Lindemann J. Value of turbinoplasty in rhinosurgery - a controlled randomized study. Rhinology. 2019; 57(5): 352-357.

33 Sommer F, Grossi AS, Scheithauer MO, Hoffmann TK, Stupp F, Briner HR, Lindemann J. Negative effects of stripe conchotomy on intranasal conditioning. ENT. 2019; 67(5): 373-378.

34 Sommer F, Lindemann J, Scheithauer MO, Hoffmann TK, Veit JA. Nasal turbinate surgery. ENT. 2017; 65: 443-456.

35 Veit J, Nordmann M, Dietz B, Sommer F, Lindemann J, Rotter N, Greve J, von Bomhard A, Hoffmann T, Riepl R, Scheithauer M. Three Different Turbinoplasty Techniques Combined With Septoplasty: Prospective Randomized Trial. Laryngoscope 2017; 127:303-308.

36 Fischer H, Gubisch W. Nasal Valves – Importance and Surgical Procedures. Facial Plastic Surg 2006; 22: 266-280.